A critical appraisal of "Sling-Based Exercise for External Rotator Muscles: Effects on Shoulder Profile in Young Recreational Tennis Players"

By

Andrew Cardenas, SPT

In partial fulfillment of the
requirements for the course:
PT 7240 Evidence-Based Practice in Physical Therapy

Department of Physical Therapy
Angelo State University
Member, Texas Tech University System

November 12, 2018

Abstract

Critical appraisal is an important skill necessary for physical therapists to learn and analyze potentially new clinical skills, techniques or to develop new questions for further research. This appraisal focuses on the question, “Can regular rotator cuff strength training in adolescent overhand athletes decrease risk of later shoulder capsular injury compared to those that do not”? Critical appraisal requires asking questions with clinical implications using the PICO format and searching databases for relevant studies by focusing on key words such as “young” and “rotator cuff”. The article “Sling-based Exercise for External Rotator Muscles: Effects on Shoulder Profile in Young Recreational Tennis Players” focuses on the question best and was chosen for appraisal. The study is based on the risk factor for rotator cuff-based injury where the principle kinematics are to force the arm into extreme internal/external rotation and the implementation of sling-based exercise to eliminate contralateral imbalances in strength and range of motion deficits. Overall the study is of high quality with limitations such as limited subject size and diversity, lack of fundamental background on sling-based exercise, individual results, and redundancy of results in discussion. Though the limitations exist, it would be recommended for clinical implementation with further research of intervention.

Keywords

Adolescent, sling-based exercise, tennis, shoulder, asymmetry

\

Introduction

As a student of physical therapy (SPT), reading quality evidenced-based literature is vital to be a practicing clinician. It allows for self-discovery in order to uncover the disciplines the student wishes to pursue and interests going forward into their career. Discovering such interests and disciplines is a skill in itself that a student of physical therapy must learn and grow in expertise in order to find, learn and apply new clinical skills, test out ideas, theories and viewpoints of peers, and most importantly challenge and appraise peer works in journals, conferences and more. In order to critically appraise, the student must learn to develop questions using the population, intervention, comparison, outcome (PICO) format. The question for this appraisal is as follows:

"Can regular rotator cuff strength training in adolescent overhand athletes decrease risk of later shoulder capsular injury compared to those that do not?"

Methods

For this question, the American Physical Therapy Association's main database PT Now and Angelo State University's library database were used to search for corresponding studies to this question. Keywords being closely looked for were "young", "rotator cuff", "little league", "shoulder", and "strengthening". The article had to be specific to young or adolescent subjects intervening in the rotator cuff and shoulder to land fewer specific articles but find authors whose focus is around shoulder pathology and intervention that could lead to a particular article. Limitations were English only to allow for better interpretation of the studies and before 2016 for a higher impact factor and more up to date information on a particular intervention. Outcome measures msut measure performance of an overhead sport such as baseball, tennis, football, etc.

Overall, the search produced only nine hits of specific articles relevant to the initial question; however, three articles truly stood out and were chosen for further appraisal.

Eventually, the article most relevant for the clinical appraisal of adolescent rotator cuff intervention was a study based on rotator cuff strength of young recreational tennis players published in January 2018 by Charles Goulet and Isabelle Rogowski in the Journal of Sports Rehabilitation in the Human Kinetics Journals umbrella called, "Sling-based Exercise for External Rotator Muscles: Effects on Shoulder Profile in Young Recreational Tennis Players". The study was conducted at the University of Lyon in Villeurbanne, France. This article was chosen for its practical intervention that measured rotator cuff strengthening, range of motion and focused on the importance of that element in preventing shoulder dysfunction. The article was specific to a particular overhead sport where the others did not.

Results

Summary of the study

The study *"Sling-based exercise for External Rotator Muscles: Effects on Shoulder Profile in Young Recreational Tennis Players",* is based on the risk factor for rotator cuff-based injury where the principle kinematics are to force the arm into extreme internal/external rotation. The authors want to provide an intervention that can be used to strengthen the external rotator muscles for stability while eliminating contralateral imbalances in strength between internal and external rotation of both arms while preventing loss of glenohumeral range of motion. They believe that sling-based exercise is the primary intervention to restore shoulder strength balance and with minimal range of motion losses. The study is 10 weeks long with 12 male tennis players. The subjects will perform five weeks of a regular tennis training program followed by 5

weeks of sling-based exercise. Outcome measures include hand-held dynamometry, changes in velocity of serve, and bubble goniometry. According to the results, subjects showed significant strength increase and no alterations of ROM after sling-based exercise training and concluded that sling-based exercise can help prevent shoulder injury, fix imbalances and even improve performance in tennis and potentially other overhand sports.

Appraisal of study introduction

Overall, the introduction was standard and comprehensive where it provided background on the interventions. Thirteen articles are used for background in the introduction providing various examples of relevant information to their study. Articles come from quality sources and journals such as the Journal of Medical Science and Sports and Clinical Sports Medicine. No references seem inadequate for providing background on the study. Purpose of the study was clear and specific outcomes were apparent in strength, ROM, and serving velocity changes with the specific intervention of sling-based exercise.

However, the authors did leave many holes in their background. The author does not give any information on what sling-based exercise where the fundamentals of the intervention are missing. Also, the term sling-based exercise is not explained well such as “the use of strap-like apparatuses for more versatile use of closed-chain body weight exercises”. Also, many of the references feature research from as old as 1996 to 2008 with only about 20% of the references from as recent as three years.

Appraisal of study methods

The study was designed to be prospective providing continuous results for 10 weeks and longitudinal across various subjects with similar criteria. Though the experiment was single-blinded, it did not matter due to the lack of a control group and only the clinicians were blinded allowing the removal of bias. The criteria of the study was good for it focused on specifically adolescent population that will hopefully provide quality data to represent that population. They also made sure the subjects had great experience in tennis competition, trained consistently and have no history of upper limb injury. All participants underwent the exact same two conditions. Overall the intervention procedure is described in excellent detail providing precise procedures on how to perform each exercise including images of the concentric and eccentric phases of the exercises specific to improving external rotation. Outcome measures were explained well and can be easily replicated. Statistical analysis models of MDC 95% and ANOVAs were verified for their quality via *Cohen's Statistical Power Analysis for Behavioral Sciences.*

The methods of the study did have their limitations. There was a poor recruitment of volunteers for this experiment. The criteria for the experiment was very specific, which improves the quality of the study relevant to the desired population, but the limitations are small sample size. All subjects were male, which eliminates the potential for gender comparisons in the study. Clinical limitations on the procedure include access to TRX or other sling-based equipment and the ability to anchor the sling apparatus down and lack of safety precautions stated in this section. Lastly, reliability and validity of the outcomes measures were not mentioned or supported by any evidence.

Appraisal of results

The results were written in an organized manner with each outcome measure explained per paragraph. The hypothesis was accounted for and compared in the results for either support or reject. Results show the MDC95% and ANOVA analysis as well as outcome measures presented and reported with none missing. Results were shown in the form of bar graphs comparing outcome measures between non-dominant and dominant arms as well as the baseline measures to regular training measures to sling-based training measures. All changes between regular and sling-based training were considered significant both statistically and clinically

The results significant omit the individual data of the subjects in the study. The paper could provide specific changes in a table format for readers see strength change variations in individual subjects and maybe some variations that might be more significant than others. The authors also fail to mention minimally clinically important difference and the number needed to treat.

Appraisal of discussion

The authors compared their results to similar studies such as comparison to high school handball players. They also cited related literature such as generating neuromuscular adaptions and even improvements on previous studies for greater quality prospectively. The authors also claim their limitations in their study such as the lack of diversity in their subject pool, lack of a control group, lack of a strength assessment of the scapular muscles and the lack of individualization in distance between feet and fulcrum projection. Future application of future study is applied multiple times, which acknowledges the limitations of the study and desire to improve.

One of the largest weaknesses of this section of the study is the redundancy of results and information in the introduction. The author cites the same studies in their references just to

reiterate them without providing application into them except the hand-ball and neuromuscular adaptations study.

Discussion

This study provides a high quality and clinically significant intervention to improving rotator cuff muscle strength without gaining range of motion deficits as a result. The significance to overhead athletes is important because though increased stability is beneficial for prevention of injury specifically anterior shoulder dislocation and rotator cuff tears, strengthening does create ROM limitations and can hinder performance. This article is indeed relevant to my question and then adds an additional factor that was not considered, range of motion.

It is fair to criticize the article for its lack of evidence, individual results of their subjects, redundancy of information throughout the article and lack of explaining the fundamental explanation and theory of sling-based exercise. However, the article is particularly strong in the procedures. They were explained in great detail and easy replication in the clinic. With clinically significant results, future study and application of this intervention can take place with access to the equipment. Though the author did not present enough applications of sling-based exercise in their literature, many studies have shown similar results and is consistent and should have been the main focus of their discussion to compare the results of other studies to theirs. The outcome measures can be applied throughout the spectrum of sports. Serving velocity correlates with pitching speed, football throwing speed and more.

Though there is good consideration to utilize the intervention, more study and appraisal of other articles should be conducted before utilizing the method in the clinic especially for athletes of other overhand sports. Risks of sling-based exercise not stated in the article should be further

researched and considered prior to utilization in the clinic. After such study, application in the clinic should be appropriate and the procedure used in this article might be the most detailed and thorough to explain the correct procedure to the patient/client.

Overall the study has a lot of potential for clinical application. Despite various limitations, they open the door for future study such as doing a longer study to see the degree of strength increases seen greater than five weeks, the impact on women, on elderly individuals older than 50 years of age, and other athletes in other sports.